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ABSTRACT

Virtual reality (VR) can create a unique and interesting environment in which students at a distance can explore and investigate objects or scenes via the World Wide Web. Creating these VR components is a process that is much more simple than many believe. This paper outlines when using VR may be appropriate in instructional settings and describes the process necessary to create a VR panorama using Apple Computer's QuickTime Virtual Reality Authoring Studio Software, including four steps: plan, shoot, stitch, and make the panorama. (Author/MES)

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QuickTime Virtual Reality for Web Delivery

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Abstract

Virtual reality (VR) can create a unique and interesting environment in which students at a distance can explore and investigate objects or scenes via the World Wide Web. Creating these VR components is a process that is much more simple than many believe. This paper will outline where using VR may be appropriate in instructional settings and describe the process necessary to create a VR panorama using Apple Computer's QuickTime Virtual Reality Authoring Studio Software.

VR and Instruction

I have been unable to find any existing research connecting learning to QuickTime VR panoramas specifically. There are however, several papers addressing VR in general as it is related to education. In 1999 Reid and Sykes touted VR as "The Ultimate Educational Technology". Several examples of how VR is being used in educational settings are listed in Young's paper "Virtual Reality on a Desktop Hailed as New Tool in Distance Education", though the paper does discuss certain problems faced by using VR in instructional settings. Many examples of QuickTime VR are can be found online with a simple web search on the terms "QuickTime VR panorama".

What about results? In a 1999 study Bowman et al found trends that suggest that students were better equipped to learn from lectures if they had prior exposure to certain materials virtually. Also, Bowman et al found trends suggesting that students exposed to a virtual environment are better able to understand the relationship between spatial and abstract information.

While designing instruction one may consider Keller's ARCS Model of Motivation. The ARCS model proposes four conditions that must be met for a leaner to be motivated. QuickTime VR could serve the "Attention" and "Relevance" components of Keller's model. Using a QuickTime VR component as part of an online lesson may gain the students attention by allowing them to navigate through an environment and explore. The relevance factor may also be addressed by allowing students to virtually visit locations, real or contrived, before lessons or discussions involving the locations take place. For example, a lesson on environmental impacts on a pond may be more relevant if the students could virtually visit a pond when physically visiting a pond is not possible. VR also would fit into Gagné's events of instruction as a strategy to gain the attention of a learner.

Kim and Song list learner motivation, possible financial savings, and safety issues as rationales for incorporating VR into instruction. Once QuickTime VR components are created, they exist. So, for instance, students from year to year would be able to virtually experience a location or object possibly saving the time and cost of an actual physical visit. Five guidelines for designing VR for instruction are provided in the paper by Kim and Song as well.

Creating a QuickTime VR Panorama

Here are the steps necessary for creating a QuickTime VR (QTVR) panorama: Plan, Shoot, Stitch, Make Panorama.

In the "plan" step you choose a location and collect the necessary equipment for the photo shoot. Locations that have as few moving objects, such as people, are best. Movement caused by phenomena like running water and blowing leaves do not cause many, if any, problems with the photos. When you have selected a location for your photo shoot, you should consider obtaining permission to take the pictures. Some private historical sites are especially concerned with photo rights. When asking for permission, be sure to indicate that your photos would be used for instructional purposes, if that is indeed the case.

The equipment I use for my photo shoots is: a digital camera, a camera tripod, and a small carpenter's level. My digital camera is a Nikon CoolPix 800. This camera has one feature that is important for the way that I shoot my photos for the panoramas. The camera's lens is centered directly above the tripod mount. This allows me to use a fairly cheap tripod. Many cameras are available with this configuration. If the camera's lens is offset from the tripod mount, a special VR tripod head would be necessary to allow the camera to pivot on the tripod with the lens centered on the tripod mount. My tripod is a Velbon CX 540. It is an inexpensive tripod.

Provided you have chosen a location and collected the necessary equipment, we are ready to move on to the "shoot" step. To shoot a full 360-degree panorama requires that you take a sequence of photos by rotating your camera on the tripod a set number degrees between each photo. You can create panoramas that are less than 360 degrees, but this paper will describe the process necessary to create a full 360-degree panorama.

My tripod has no original equipment that will allow me to rotate the camera through set degree increments. Using masking tape, a ruler, and pen I added a ring of increments to the head of my tripod that

measures twelve 30-degree increments. This is a good number of pictures to start with, though with other cameras you may need to increase the number of photographs. There may be some trial and error necessary to determine the number of photos necessary for your camera. To begin taking your pictures, set up your tripod and camera in the desired location. Having your camera level is essential for creating smooth, high quality panoramas so take the time to establish a sturdy and level camera site. My tripod has a small level incorporated into it. I use my carpenter's level to double check the tripod's level and to make adjustments, if necessary. Check for level in at least two different directions on your tripod. Once I have a level and sturdy camera site I take my pictures. I take one picture at each of the twelve increment marks on my tripod head. If your camera has a remote control, use it. The fewer times you have touch the camera once it is prepared, the less likely you are to knock it out of alignment for your pictures. Moving the tripod or knocking it out of level will mean that you start over leveling the tripod and camera set up. Also, as you take the necessary pictures to produce the panorama, you do not want objects that move a great deal or ones that will be in more than one of the sequence of pictures. This can cause "ghosting" and other inconsistencies in the next step of the process. Once you have your pictures, transfer them to your computer.

A set of sample photos is available at:

http://homepage.mac.com/qtvrchuck/

for your experimentation.

Now we are ready to use the QuickTime VR Authoring Studio software to create the panorama. This is the "Make Panorama" step. In this discussion we are using version 1.0 of the software and Mac OS 9.2.2. The next two steps will use this software. When we have completed these steps, you will have a finished QTVR panorama of your chosen location.

Launch the QTVR software. In the "File" menu select "New" and "Panorama Stitcher" in the corresponding submenu. A menu will appear on your screen. Assign your panorama a name and location on your computer and click the "Save" button. For the purposes of this discussion I will name my file "learnVR". You should now see a window titled "Panorama Stitcher:learnVR" on your computer screen. In that window be sure that "Images Wrapped" is checked if you are making a full 360-degree panorama. We are, so it should be checked. Select your camera lens in the "Lens:" pull-down menu. If your

camera settings are not listed, get the manual that came with your camera. Click on the "New" button to create the lens settings for your camera. Enter a name for yours lens and the focal length of your camera lens in the appropriate boxes. Enter "30" in the "Recommended degrees between images" box since we took twelve pictures, each 30 degrees apart. Click "Calculate" to have the software calculate the vertical angle of view measurement. You should now see the "Lens Calculator" window. Adjust your film size, if necessary and click the "Use" button to select landscape or portrait mode. For my camera the settings are: focal length = 38 mm and "Landscape".

Now you are ready to add your photos. You can do this simply by dragging a folder containing your twelve photos to the lower portion of the "Panorama Stitcher:learnVR" window. Your camera probably named your photos sequentially. This is good. If it did not do so, you should before adding your photos to the stitching window. Names like "photo01.jpg", "photo02.jpg", ... , "photo12.jpg" work well. You may need to rotate your photos once they are loaded using the "Rotate" button in the "Panorama Stitcher:learnVR" window. Rotate them so the photo orientation is such that you can view the pictures like they were taken. Now click the "Stitch Pano" button at the far right on the window. In a few minutes, the software will generate a stitched panorama photograph titled "learnVR.pict". A window titled "learnVR.pano" will result when the stitching is complete. This is what your QTVR panorama will look like. You may also navigate and zoom in and out of this window to set initial settings for the QTVR panorama. If you are pleased with the result, click the "set playback settings" button in the "learnVR.pano" window to create the final QTVR panorama. The end result after a few moments is a QuickTime movie named "learnVR.pano". This movie is a navigable QTVR panorama ready for web delivery or local computer use.

If you so desire the panorama photo "learnVR.pict" can be edited with graphics programs like Photoshop. To do this, quit the QTVR Authoring Studio and perform your image adjustments. You may choose to brighten the photo or add annotations to certain portions of the photo. If you do edit your photo, be sure that the height and width dimensions of your photo are evenly divisible by four. This is necessary to make the final QTVR panorama. Once you are happy with your image, you may continue with the QTVR Authoring Studio. Launch QTVR Authoring Studio. In the file menu select "New" and "Panorama Maker" in the corresponding submenu. Add your edited panoramic image via the "Add Image..." button and click the "Make Pano" button to generate your final QTVR panorama.

The finished QTVR created from the sample photos referenced above is available online at:

http://homepage.mac.com/qtvrchuck/

I highly recommend the book "QuickTime for the Web for Windows and Macintosh" 2nd edition if you plan to work with QTVR or other elements of QuickTime. It is an excellent reference.

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